Monitoring of the CO_2 natural baseline levels at the seafloor

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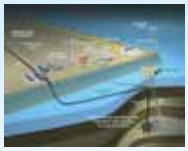
CCS Erse actvity

The activities are carried out by the Environment and Sustainable Development Department of ERSE S.p.A., with four focal purposes:

- the identification and geological characterization of the Italian potential storage sites;
- the numerical modelling of the geological reservoirs and the study of the short- , middle- and long-term evolution of the CO2 plume, in order to verify the safety of the process;
- the development and the experimental tests of monitoring systems useful to control and to ensure the safety of the storage;
- the study of the public acceptance and of the legislative aspects of CCS.

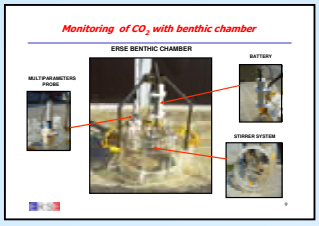
CAPTURE

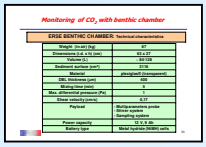

SEQUESTRATION

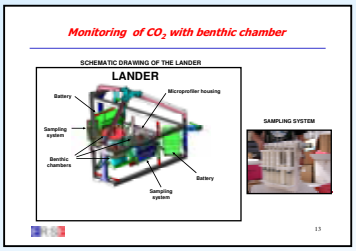
RISK ASSESSMENT

PUBLIC ACCEPTANCE

Experimental set-up

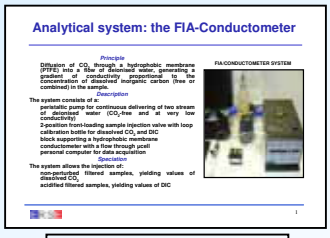


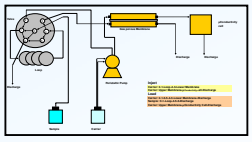




The main conclusions from studies on capabilities and limitations of reviewed CO_2 monitoring techniques in seawater are:

- There is no experience within offshore CO_2 monitoring in the sediments, at the seafloor and in the water column related to geological storage of CO_2.
- A wide range of monitoring techniques for CO_2 are available, but in many cases with limited experience for monitoring in the marine ecosystem.
- Area coverage is very limited for most of the techniques not relying on survey
- Extensive experience is gained with Acoustic monitoring techniques mapping the sediments and providing bathymetric data (the possibility of adapting these techniques for CO_2 monitoring is expected to be good).
- Acoustic monitoring techniques in the water column are believed to have good potential for CO_2 monitoring both in liquid and gas phase.
- Various seawater chemistry measurement techniques are available to measure dissolved CO_2 in water (high accuracy CO_2 monitoring in water is proven for on board measurement, but the experience and maturity with accurate and reliable *in situ* capability sensors are limited).
- The different monitoring techniques have there own strengths and weaknesses and no single technique seems suitable for monitoring free CO_2 in both liquid (drops or plume) and gas phase (bubbles) in addition to dissolved CO_2 (molecular solvated).





CO_2 MAIN ASPECTS & EXPERIMENTAL APPROACHES

Site representativity (spatial-temporal variability)

Benthic Chambers
Benthic Landers

Natural baseline levels → Seafloor characterization (diagenetic processes)

Physical (bubbles or dissolved) and Chemical (carbonate system: pH, TAlk, DIC, pCO_2) speciation and transport mechanisms

Origin: fossil or biogenic

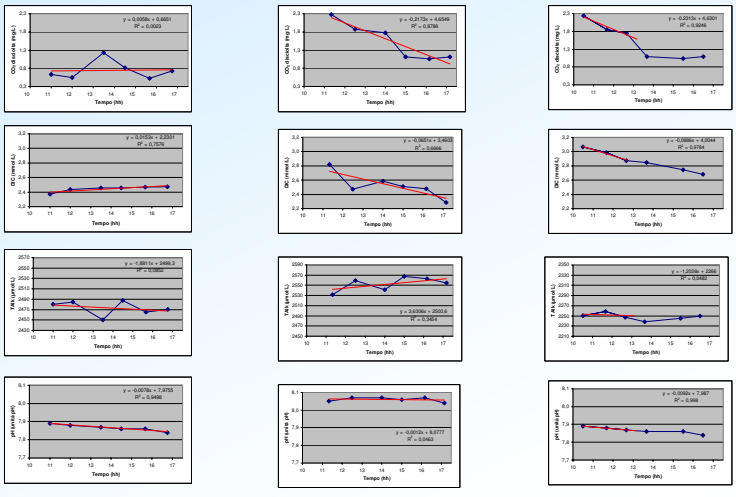
$\delta^{13}C_{DIC}$

Flow Injection Analysis/Conductometer system

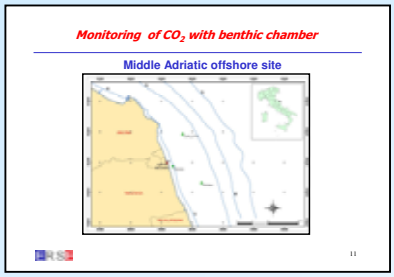
Experimental survey

Trends of the concentration of CO_2, DIC and TAlk inside the Benthic Chamber at the three Station

CARLOTTA | MANILA | DALILA



Site map and Station location



Benthic fluxes (mmol m^{-2} day^{-1})

Station	Dissolved CO_2	DIC	TAlk
CARLOTTA	1	129	-16
MANILA	-43	-562	31
DALILA	-45	-766	-10

Acknowledgements
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